



# CAIT

Center for Advanced Infrastructure & Transportation  
Rutgers, The State University of New Jersey

## QUARTERLY PROGRESS REPORT

Project Title:	Operational Improvements at Traffic Circles (Project 2002-16)		
RFP NUMBER:		NJDOT RESEARCH PROJECT MANAGER: Robert Sasor	
TASK ORDER NUMBER/Study Number: 129 / 4-26544		PRINCIPAL INVESTIGATOR: Kaan Ozbay (Rutgers) / George List (RPI)	
Study Start Date: 01/01/2002 Study End Date: 12/31/2004		Period Covered: 3 <sup>rd</sup> Quarter 2004	

Task	% of Total	% of Task this quarter	% of Task to date	% of Total Complete
Phase 1: Preliminary Literature Search	5%	50%	100%	5%
Phase 2				
Task 1: Literature Review	10%	25%	100%	10%
Task 2: Selection and Use of Computer Tool.	10%	100%	100%	10%
Task 3: Evaluation of Operational Alternatives.	30%	20%	68.5%	20.55%
Task 4: Safety Evaluation	20%	10%	30%	6%
Task 5: Cost – Benefit Analysis	10%	10%	50%	5%
Tasks 6: Final Recommendations	5%			
Tasks 7: Administration / Final Report.	10%	10%	30%	3%
<b>TOTAL</b>				<b>59.5%</b>

### Project Objectives:

**Objective 1:** Simulation Modeling and Validation of Geometry and Traffic Patterns of Existing and Proposed Operational Improvement Alternatives of Circles Under Study.

**Objective 2:** Determination and Evaluation of Operational and Safety Improvement Alternatives using a Series of Measures of Effectiveness (travel time, delays, air pollution, gas consumption, etc.)

**Objective 3:** Recommendation of best operational and safety improvements based on a rigorous and realistic cost-benefit analysis

### Project Abstract:

Traffic circles have been used in the United States since 1905. However, their use has been limited since the 1950s due to the realization that they worked neither efficiently nor safely (NCHRP- WEB Page). Recently, there has been increasing interest in improving existing traffic circles to address these safety and efficiency problems. Several States including New Jersey are in the process of exploring effective operational alternatives for enhancing safety and efficiency of these traffic circles built in the early parts of 20th Century.

Many existing traffic circles in New Jersey that were designed to handle lesser traffic volumes than today's volumes fall under this category of traffic circles that need to be improved since they are faced with increasing congestion and accident problems. Although replacement of these traffic circles appear to be a viable option time and money needed for the construction of alternative solutions can be prohibitive especially in this atmosphere of diminishing resources for any kind of major investment due to the budget problems of the State.

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
623 BOWSER RD. PISCATAWAY NJ 08854-8014  
TEL: 732-445-0579 FAX: 732-445-0577



# CAIT

Center for Advanced Infrastructure & Transportation  
Rutgers, The State University of New Jersey

The next best option appears to be the implementation of operational alternatives that can extend the life of these circles until they can be rebuilt in the next 5 to 20 years.

To study operational alternatives, traffic simulation computer software that can accurately model the geometry & traffic on circles, and provide animated graphics of traffic movements is needed. The major goal of this computer based analysis of the traffic circles as proposed in this study is to accurately evaluate the effectiveness of various traffic engineering measures such as ramp metering, sign and line treatments, reconstructing or adding lanes, in terms of improve traffic flow or safety at a specific circle.

#### 1. Progress this quarter by task:

- **Task 3:** We completed the first phase of data collection at all three circles

Below a summary of our efforts in this quarter:

- Data extraction is completed for the Brooklawn traffic circle. The extracted data include (i) vehicle counts at every 15 minutes with percentage of trucks and passenger cars, (ii) vehicle inter-arrival times, (iii) vehicle queue wait time before yield signs, (iv) vehicle wait times at yield signs, (v) gap acceptance/rejection times at yield signs.
- Data collection and extraction for Asbury circle is completed. Currently, the PARAMICS model of Asbury circle is being expanded to include traffic signals nearby the circle.
- PARAMICS model for the Brooklawn circle was calibrated using the traffic counts extracted from the data. Traffic signals have been added to the circle based on the signal timings provided by NJDOT. The validation /calibration for the base year is complete for this circle.
- Sensitivity analysis for Brooklawn circle model both base and proposed scenarios was completed.
- Also using the API feature of PARAMICS, we have modified the vehicle gap acceptance function based on the extracted data. This modification resulted in more realistic traffic characteristics. This feature will also be used in the simulation analysis of Asbury circle.
- **Task 4:** RPI Team continued to work on analyzing the existing accident data. RPI also continued to work with the PARAMICS model for the safety analysis. A new Ph.D. student, Alix Demers joined the project.
- **Task 5:** The draft chapter for the Cost-Benefit analysis includes the analysis of Brooklawn circle with the proposed operational alternatives as suggested in the DVRPC report.

#### 2. Proposed activities for next quarter by task

- We will continue Tasks 3, 4 and 5.

#### 3. List of deliverables provided in this quarter by task (product date)

A revised interim report on Tasks 3 and 5 – Modeling and validation / calibration analysis of Brooklawn Circle using PARAMICS and a detailed description of C/B analysis as a methodology and also as applied to Brooklawn Circle.

#### 4. Progress on Implementation and Training Activities

Mike Asson and other NJDOT technical personnel were visited on August 13<sup>th</sup>, 20<sup>th</sup> and 23<sup>rd</sup> to demonstrate the PARAMICS simulation models of the current design and the proposed operational and geometric design of Collingwood traffic circle. Also, on August 25<sup>th</sup>, Rutgers team joined the NJDOT officials in the public meeting of the project, where the PARAMICS model of the Collingwood circle was presented.

#### 5. Problems/Proposed Solutions

---

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
623 BOWSER RD. PISCATAWAY NJ 08854-8014  
TEL: 732-445-0579 FAX: 732-445-0577



# CAIT

Center for Advanced Infrastructure & Transportation  
Rutgers, The State University of New Jersey

---

We needed to collect additional summer data for the Collingwood circle to study seasonal factors. This was done during the last week of August (Aug 20<sup>th</sup> and 27<sup>th</sup>). We also collected additional seasonal data at the Asbury circle on August 26<sup>th</sup>. We are in the process of extracting this new data.

Total Project Budget	\$ 422,524
<b>Modified Contract Amount:</b>	
Total Project Expenditure to date	\$246,511
% of Total Project Budget Expended	58%

\* These are approximate expended amounts for the project; these estimates are for reference only and should not be used for official accounting purposes. For a more accurate project accounting please review the quarterly invoice for this project.

---

DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING  
623 BOWSER RD. PISCATAWAY NJ 08854-8014  
TEL: 732-445-0579 FAX: 732-445-0577